

*With Dr. Brand's Compliments.*



# The Exogenesis of Cancer.

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# THE EXOGENESIS OF CANCER.\*

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GENTLEMEN,—I make no apology for again introducing the subject of the ætiology of cancer. The elucidation of this disease is, or ought to be, the burning question of the day. When we consider the number of victims it annually hurries to the grave after a period characterised by great bodily suffering and mental depression ; the dread of its advent by those not yet attacked ; and the reproach which it undoubtedly is to the science of medicine, the duty is obviously incumbent upon the medical profession to make every possible effort to discover its cause and cure. We have a personal as well as a scientific motive in trying to make this discovery, for although we are medical men, we do not on that account possess a prophylactic talisman to confer upon us exemption from cancer, and therefore we are just as liable as other people to contract it, and even more so from our coming more frequently in contact with it than members of the laity generally.

I do not propose to-night to discuss the many theories and

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\* Thesis read before the Branch on March 20, 1903, with a view to eliciting a discussion on the subject, with subsequent additions.

suggested causes of cancer which have been from time to time promulgated and found insufficient, but shall confine myself to bringing before you evidence of its exogenesis.

The term "cancer" is used throughout, generically, to include all that is clinically understood as "malignant"; also the wider term "infection" will be understood to include the more restricted one of "contagion."

I presume it will be freely admitted that, in making a diagnosis, if any one point is absolutely inimical to it that diagnosis must be discarded. For example, however closely neurasthenia may simulate Landry's paralysis, if the reflexes are intact, then Landry's paralysis must be excluded; and conversely, however anxious one may be to consider a case of Landry's paralysis to be one of neurasthenia, if the reflexes are gone, then the more favourable diagnosis must, of necessity, be abandoned. In like manner I claim as a postulate that, *for the alleged cause of a disease to be acceptable, it must necessarily be of universal applicability. In other words, if any alleged cause entirely fails in any one case, then that cause cannot be the true and exclusive one.* My contention, and it is also my implicit belief, is that cancer arises from without the organism by infection, and that infection occurs only under certain favourable conditions which render the organism vulnerable, *i.e.*, that a *condition precedent* must be established, produced by irritation, occurring within or without from any cause; or by injury; or by degeneration of tissues from obsolescence or senility; or by chronic disease; or by congenital susceptibility; and that no other hypothesis will satisfactorily explain the incidence of cancer in every case. I cannot, therefore, admit as tenable such alleged causes as uric-acidæmia, the influence of arsenic, excessive consumption of flesh or of common salt, &c.; or any of the theories such as Cohnheim's, Hansemann's, Thiersch's, &c., for not one of them is applicable to each and every case. At the same time, while utterly rejecting such alleged causes as untenable, I freely admit their possible connection with cancer, but only in so far as they may induce, or help to induce, a condition precedent.

WHAT FACTS ARE KNOWN ABOUT CANCER, AND WHAT MAY  
BE LOGICALLY DEDUCED FROM THAT KNOWLEDGE?

We know that cancer is a specific disease, and therefore it must arise from a specific cause.

We know that it is intensely infectious to the individual, and therefore it must be capable of infecting others.

We know that it propagates itself by infection of its immediate environment and by metastasis, and that metastasis is the chief agent of dissemination in many other germ-caused diseases.

We know that cancer is pre-eminently a human disease, and that it occurs only in such of the lower animals as are intimately associated with man, and that it is practically unknown in wild animals. This may fairly be looked upon as very strongly suggestive of contagion.

We know that cancer has favourite sites and favourite tissues (the epithelial), all easily accessible from without, and many of them are ideal culture chambers.

We know that cancer haunts favourite localities which are all of the same character, and favourable to the harbourage and growth of bacteria.

We know that irritation of some sort is closely associated with cancer, so much so that it is recognised as practically always precedent, thus preparing the soil for the reception of the infective agent.

We know, also, that cancer is purely and wholly a local disease at the outset, and that any success in surgical treatment has been attained only by early operation, and that operation in advanced cases is only palliative, and not always that. This initial local condition is strongly suggestive of contagion from its resemblance to other germ-caused diseases.

We find in cases of cancer, when the disease has become well established, a well-marked cachexia similar to what is observed in the later stages of chronic infective diseases.

While cancer is strictly analogous to no other single disease, admittedly germ-caused, it is analogous to many of these diseases in some one or other of its features, with the exception of one. This exception is the peculiar and characteristic nature of its



metastases. These are said to mimic the structure of the primary growth, but there is no mimicry here. They are histologically identical in structure with the primary tumour, which indicates that migration of the cells of the original growth occurs, as well as of the infective particles.

This migration of epithelial cells is generally looked upon as extraordinary, and is even used as an argument against the exogenesis of cancer; but there is nothing wonderful about it, for the very structure of cancerous tumours favours and induces it. The cause and structure of these metastases are evident when their origin is understood. A malignant growth *arises* in the first instance from a cell or cells, under the influence of a stimulus, more than probably external, taking on autonomy and proliferating actively. It *consists* simply, in the case of the epitheliomata, of epithelial cells lying more or less loosely in meshes or alveoli of connective tissue, called stroma, to which they are not in any way attached, and which does not pass between individual cells. Lymphatic channels communicate freely with the alveoli, in fact the alveoli may be regarded as dilated lymph spaces which are the radicles of the lymphatic trunks, and these latter lead to the lymphatic glands. Thus the epithelial cells are bathed in the lymph, and being dislodged by their own overgrowth, or of their own free will, they cannot help entering the lymphatic stream. Blood-vessels run in the stroma and are often dilated, and being invaded by the actively proliferating cells, the latter enter the general blood circulation.

In the case of the sarcomata, the growth consists chiefly of cells which are derived from connective tissue, and are embedded in a stroma which is intercellular and closely connected with them. The smaller blood-vessels are in direct contact with the cells, their walls being often formed of nothing but the cells of the sarcoma, a single layer of endothelial cells separating the blood from the tumour cells. Thus it is easy for portions of the growth to be carried away in the blood stream. There are no lymphatics in sarcomatous tumours. These living, infective, autonomous cells, carried away by the blood and lymph streams, as emboli, on becoming impacted, establish new malignant colonies by the active proliferation of the cells themselves and

the reproduction of their contained germs. These metastases in turn repeat the process until at length the organism is overwhelmed and overcome by their malignant action.

This migration of autonomous malignant cells has its parallel in the migration of normal cells. For example, healthy osteoblasts, under the influence of some stimulus, probably mechanical, break adrift from their moorings and, coming to rest in muscle substance, found, in the interfibrillar connective tissue, a flourishing colony of bone, and this is known to the pathologist as "myositis ossificans."

### WHAT IS RECORDED OF CANCER ?

In my address on the ætiology of cancer I have given instances of cancer-à-deux, of auto-inoculation, of accidental and operative inoculation, and also of experimental inoculation, quoting reliable authorities, and I need not repeat them here. I have also given instances of cancer-haunted districts, houses, and even rooms reported by careful observers.

Since reading my address in May last, I have received the presidential address of Mr. Nash of Bedford, president of the South Midland Branch, on the subject of cancer in North Bedfordshire. He records no less than thirty cases of cancer-à-deux and cancer-houses occurring in his district alone. He also quotes from Dr. Behla's investigation into the infectious origin of cancer, which is so interesting and significant that I repeat it here.

"The town of Luckau, in Bavaria, consists of a central main portion with 3,000 inhabitants, flanked on the east and west respectively by sub-divisions of the city called Kalau and Sando, each with a population of 1,000, making 5,000 in all. In twenty-two and a half years (1875-1898), no cases of cancer occurred in the western suburb, Sando; cases were not infrequent in the central main town, and 73 deaths from cancer, out of a total of 663 deaths from all causes, occurred in the eastern suburb, Kalau. Cancer therefore caused 1 death out of 9 in Kalau, against 1 out of 25 or 30 in the entire town, whereas no cases occurred in Sando. During the twenty-two and a half years the number of inhabitants and their habits of life remained the same. The

population is agricultural and lives on the products of its own gardens and fields. The dwellings are similar in size. The soil of Kalau and the central town is flat, low and moist; that of Sando elevated, sandy and dry. A stream or ditch closely encircles the central town and Kalau. Cancer followed the course of this ditch. In Kalau all the gardens are watered by it.

Of the 127 houses in Kalau 56 were cancer-houses; 45 had a single case, 10 two cases, and 1 four cases. Behla attributed this unequal distribution of cancer to the location of the ditch. In the cancer suburb all the gardens were watered from it, and the people were in the habit of rinsing vegetables in the water from it, which is stagnant and foul. Behla believed that the vegetables were infected from the water of the ditch, and the people by the vegetables, large quantities of which were eaten raw. Behla considered that a parasite must be the cause of this irregular distribution of cancer."

Can any reasonably intelligent being, after reading such evidence as this, hesitate for a moment to admit the extreme probability of the external origin of cancer? If anyone remains unconvinced let him apply the touchstone of these statistics to any other suggested theory of the causation of cancer. Think for a moment of the miraculous assembling of the hypothetical embryonic rudiments in Kalau and their total avoidance of Sando; think of Kalau's selfish monopoly of all the available spermatic influence of cells; think of the deplorable amount of unconscious evil memory of the tissues exhibited by the inhabitants of Kalau; think of the extraordinary amount of wear and tear of the unfortunate people of Kalau, which is requisite to induce the too rapid growth of their cells and consequent degeneration necessary to the development of cancer, and how placidly the people of Sando must spend their existence; then we must presume that Kalau is given over to excessive flesh eating, uricacidæmia, the excessive consumption of common salt, and to the malign influence of arsenic, while Sando, on the contrary, must be vegetarian, shunning salt, and be free from the evil effects of arsenic.

It is only waste of time to pursue farther this *reductio ad absurdum*, and it must be clearly evident that only one explana-



tion of Behla's statistics can be tenable, and that is what he suggests, viz., infection from without.

### THE CHANNELS OF INFECTION.

Since the favourite site of epithelial cancer is some part of the mucous membrane, the mouth and respiratory passages suggest themselves as very obvious channels. The very objectionable fashion of long skirts, which sweep the filthy, germ-infected streets, and the open and loose arrangement of their nether garments, suggest another obvious channel of entrance in the case of women, who notoriously suffer from cancer of the generative organs. Again, when one considers the enormous number of the sweat tubes whose calibre is immense in proportion to the excessive minuteness of micro-organisms, the wonder is that we ever escape any germ-caused disease, for our skins must be fairly full of germs in spite of the ordinary methods of cleansing. Charles Creighton, in a monograph which he has lately published, entitled, "Cancers and other Tumours of the Breast," claims to have discovered their true seat and anatomical cause. He states that mammary tumours do not arise from the breast-gland proper, as is generally supposed, but from the large sweat glands of the mammary skin.

With this interesting pathological point I am not to-night concerned, beyond accepting the opportunity it affords of drawing attention to this confirmation of the sweat tubes being a channel of infection, and to the explanation it offers of the great frequency of mammary cancer, while at the same time it commends itself to me as an argument in favour of the external origin of cancer. Once admitted to the organism by any channel a germ can easily find its way to any part of the body, and where vulnerability exists from any cause, there it can initiate malignant disease.

### CANCERODERMS.

I took the liberty of introducing a new term in connection with cancer, viz., "Canceroderms" to describe the cutaneous angiomata found so often accompanying cancer, especially of the breast. It has been maintained by many that such angiomata are not pathologically connected with cancer, but that they occur

quite independently of it. The angiomas, however, described by De Morgan, Leser and myself are *sui generis*. There are not infrequently to be found in apparently healthy individuals, angiomas of the skin, some even congenital, scattered irregularly over the body and extremities, but they are few in number and small in size, and are no more the typical angiomas found, for example, clustered many and large round a cancerous mamma, and which once seen can be neither forgotten nor mistaken, than the pustules of acne on the forehead and chest are identical with the pustules of variola, although the former have been mistaken for the latter. Moreover, these angiomas have been observed to appear after operation on the breast and were rightly considered of bad omen. I make no dogmatic assertion that these angiomas are genuine canceroderms, but I consider that their presence in certain circumstances is of very sinister significance. I only suggest their highly probable direct pathological relationship to cancer. I fully described these skin manifestations in my address, so that I need not now waste time in repetition.

#### HEREDITY.

With regard to heredity there is no evidence that transmission of the disease itself has ever occurred. Even in the case of women suffering during pregnancy from cancer of the uterus itself, the children born of such mothers have not been known to have contracted the disease. Nor can the children of cancer-free parents, who may subsequently contract the disease, be expected to inherit what their parents did not at the time possess, and therefore could not bequeath. The occurrence of cancer in several members of a family, after the death of parents from that disease, does not necessarily point to heredity so much as to infection from a very obvious source. Suppose, however, that an infant is born with a cancerous tumour of a cancer-free mother, as I believe has occurred, how can the incidence of the disease be accounted for? To my mind such a case would indicate infection from without, the germ which has gained access to the parent in some way, having finally come to rest in the foetus instead of the mother, who is relieved of the cancer by the natural process of parturition, instead of artificially by surgical operation. The

warmest advocates of heredity cannot muster more than 50 per cent. of cancerous parentage, which means that the evidence, even according to them, is exactly as much against heredity as it is in favour of it. At the same time, nothing like this percentage is admitted by pathologists, indeed the question of inheritance is rapidly becoming entirely disregarded. I presume no one would seriously allege that scarlet fever, measles, influenza, &c., are hereditary, and yet it is a fact that the children of parents who have had these diseases also suffer from them ! It is notorious, however, that some children are much more susceptible to infectious diseases than others, and the former probably have inherited from their parents a congenital susceptibility. The most that I am disposed to concede to heredity is that cancerous parentage probably confers a congenital vulnerability beyond the normal, such as occurs in the case of tuberculous parents, nothing more.

#### PROPHYLAXIS AND TREATMENT.

This subject hardly comes within the scope of my thesis, but I introduce it because it has a direct bearing on the hypothesis that cancer is an infectious disease.

With regard to prophylaxis against cancer, the key-note is scrupulous cleanliness, in its widest application, as it likewise is in the case of all dirt diseases. Personal cleanliness is, in my opinion, best attained by the frequent use of the Turkish bath. The hot, dry air of this bath causes perspiration to ooze freely from every pore, carrying with it any impurity lodged in the sweat tubes, germs included. Great thirst is naturally produced, which demands the imbibition of cold water in abundance. Following on this, perspiration becomes still more abundant and free, from the absorption of the water. Now this water has been absorbed by the capillaries and venules of the mucous membrane of the stomach, and having thus entered the blood it is carried through every organ and every part of the body, so that before reaching its outfall on the skin in the form of sweat, it has previously irrigated the entire organism from centre to periphery. The subsequent massage and thorough washing down with hot water and soap, followed by a cold plunge, turns out the bather clean, both within and without.



A very important point in prophylaxis is that food should never be taken with unwashed hands, and vegetables which are to be eaten raw should be most thoroughly cleansed by scrubbing, &c.

Notification should be adopted, for this would enable precautions to be taken against the spread of the malady, and would afford more accurate information as to the localities where the disease arises than can be obtained from statistics as to the places of death from cancer. Notification should be followed by disinfection of infected houses, bedding, clothing, &c. Cremation of bodies, dejecta and dressings should be practised. The purity of drinking water should be ensured.

In the absence of a demonstrable micro-organism there is little hope of the preparation of an antitoxin, nor does the experience with that prepared from the tubercle bacillus hold out much hope from the serum treatment of cancer.

I believe the use of electricity in the various forms of Roentgen rays, Finsen light, currents of high frequency and potential, has been found beneficial in certain forms of cancer, and it is possible there is a more extended future before this method of treatment.

The successful treatment of syphilis by two of the most powerful antiseptics we possess, suggests hopefulness of similar success in the treatment of cancer from a medical point of view.

Is it Utopian to suggest that some bactericide, for example, salicylic acid in the form of salicylates, or formalin, which latter has, I believe, been successfully employed in septicæmia, freely diluted and imbibed during repeated Turkish baths, and so brought into intimate contact with cancerous tumours throughout the body, through the medium of their blood-supply, may have a beneficial effect? This method, I venture to submit, is worthy of experimental employment.

#### STATISTICS OF MY OWN PRACTICE.

I have been requested to give the cancer statistics of my own practice, and I have pleasure in stating them generally. I must, however, suppress the more interesting items of cancer-houses, &c., for my allusion to such in my address was strongly resented by the local Fathers. I may state that during 1901, as re-



ported by the Medical Officer of the East Riding County Council, the death-rate from cancer, for the town in which I practice, was twice the average death-rate from this disease for the whole county. I have not seen the report for the year 1902, but I hope and believe that the death-rate from cancer will not be so high.\*

During almost twenty years of practice in town and country, I have attended 113 cases of malignant disease, of which 104 have died, two have left the neighbourhood, and seven remain under observation. Seventy-six died in the town and twenty-eight in the surrounding country. Thirty-seven were males and sixty-seven females. As is usually the case, cancer of the alimentary tract and accessory glands yield the highest percentage, viz., 57 per cent., the reproductive system follows with 21 per cent., the breast was affected in 14 per cent., and other parts in 12 per cent. Fourteen were operated on, including one case of cerebral neoplasm. The greatest number of deaths in any one year was ten, in 1890, eight each in 1892 and 1897, and seven in 1886. The smallest number in any year has been three. These figures of course apply to my own practice alone, and are independent of those of my fellow medical practitioners, which I am unable to supply, and I may say that I have no monopoly of cases of cancer.

#### OBJECTIONS TO THE INFECTION HYPOTHESIS.

I should like to mention a few objections to, and arguments used against, infection and exogenesis which have been made to me. Several of them should not be considered seriously, were it not that they may prejudice and even deceive the unwary.

(1) *Cancer cannot be an Infectious Disease, because the Infections Germ has not been found.*—This is obviously merely begging the

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\* The Report of the Urban Medical Officer of Health for March, 1903, states that of the twelve deaths for the month three were due to malignant disease, "which is a high percentage." He concludes his report by saying: "I am of opinion that cases of phthisis and malignant disease should come under disinfection as well as the notifiable diseases."

I presume it was in accordance with this view that the Inspector of Nuisances was directed to disinfect a bedroom after a fatal case of cancer. I need hardly add that this is a wise and sensible proceeding, as well as a highly enlightened one.

question. Non-discovery and non-existence are not synonymous terms. Further, the same objection may be made equally in the case of scarlet fever, and many other diseases admittedly infectious.

(2) *There is Complete Absence of all Proof of Real Infection.*—This objection can only be made by him who is either entirely ignorant of the literature of cancer, or who resolutely shuts his eyes to the evidence of those who have collected and recorded many cases of genuine and undoubted infection, and whose scientific status is beyond cavil.

(3) *Cancer is not Strictly Analogous to any known Infectious Disease.*—It is not, why should it be? Every infectious disease has its own peculiar characteristics and its own peculiar germ; and every pathogenic germ has its own peculiar and characteristic malign influence. One might with equal justice say that radium cannot be a metal, because it is not strictly analogous to any other known metal.

(4) *All Infectious Diseases have a Tendency to Self-termination, whereas Cancer is Persistently Progressive.*—This is, of course, a pure fallacy. All infectious diseases do not tend to self-termination. Both tubercle and leprosy tend notoriously to be progressive, although, in common with cancer, cases of these diseases have been known to completely disappear spontaneously.

(5) *In a Disease so common as Cancer, more cases of Cancer-à-deux would be expected, while they are so rare as to be Explicable by Co-incidence.*—This is simply a question of lack of observation. The rarity is due to the fact that such cases are not looked for. Cancer arises in no happy-go-lucky fortuitous manner. If there is any truth in my contention that cancer arises by infection from without, then every case of cancer is one of cancer-à-deux, mediate or immediate. Again, co-incidence cannot possibly account for the case recorded by Tross, of a man who suffered from cancer of the glans penis, showing a histological structure of uterine-cervical epithelial cells. Such a case as this, and it is not a solitary one, for over fifty-eight such have been recorded, is alone sufficient to prove these three points:—The infectivity of cancer; the external origin of cancer; the inoculability of cancer in man.

(6) *There are very many kinds of Tumours which differ so much from each other that a different Germ would be required for each.*—This is the merest quibble. Clinically there are only two classes of tumours, viz., the benign and the malignant. The former are for the most part simply local hypertrophies of normal structures and tend to remain so, and they do not form metastases. Benign tumours therefore do not require any specific germ to originate them, simple stimulus of a mechanical nature being quite sufficient in many cases for the purpose. They are comparable to the pearl of the oyster, which is simply a deposit of a normal substance around a foreign body. Malignant tumours are of two kinds, differing in origin but alike in character. They are those arising from epithelium and called epitheliomata, and those arising from connective tissue and known as sarcomata. All other difference in form and structure simply depends entirely on the tissue of origin and the proportionate relationship of cells to stroma. The old notion that there is a special cell indicative of cancer is quite erroneous. Malignant tumours all behave alike, infecting their environment, tending to ulcerate, forming metastases and eventually destroying the organism. Such being the case, one germ for each of these two classes is quite sufficient, by attacking the various tissues under the favourable conditions already stated, to initiate malignant action; and since it has been found that the same germ may produce totally different diseases in different plants (as pointed out by Mr. Jonathan Hutchinson, in the *Lancet* for August 31, 1901), there is no reason to doubt that one germ alone is capable of initiating malignancy in every case.

(7) *Tubercle and Leprosy are Destructive Diseases, while Cancer is Constructive.*—This is another fallacy. All these diseases are at first constructive, as all tumours are. Nodular leprosy is markedly constructive and tends to remain so. Rodent ulcer, which is malignant, is destructive from the outset. Again, malignant tumours, at first constructive, rapidly tend to become destructive, for by their hasty and ungoverned overgrowth, they cut off their own blood-supply and so initiate a suicidal necrosis, which is completed by the germs of suppuration.

(8) *Why should Benign Tumours become Malignant?*—Why



should they not? Consisting as they chiefly do of local hypertrophies of normal structures, they are obviously equally liable to infection, after irritation or traumatism, with the tissues themselves from which they spring. In certain situations, too, by their very overgrowth they, like malignant tumours, also cut off their blood supply and so induce necrosis, and where the germs of suppuration easily gain admission cancerous germs can equally easily do so.

(9) *Sarcoma has been observed to follow removal of a Benign Fibroma from a Tendinous or Periosteal Structure, the Malignant Change being due to Degeneration of Tissue.*

This doctrine of degeneration is made very free use of by the non-believer in infectivity, and besides being entirely hypothetical it does not fulfil the postulate I claimed at the outset of my thesis. A witty patient of mine calls influenza the "doctors' big umbrella," because it is the term used to cover many diseases which are not diagnosed. "When in doubt call it influenza"!! When the non-believer in exogenesis of cancer can suggest no other reasonable cause for cancer he falls back upon degeneration of the tissues.

Degeneration, as I have already pointed out, is one of the factors in establishing the condition precedent, but it cannot *per se* initiate cancer. It is most unfortunately true that cancer very often indeed attacks persons in the very prime of life, with no degeneration in particular going on, but in them the necessary condition precedent has been established by other means. In the case in point surgical traumatism was just what was required to prepare the soil for invasion by an external infective agent, and the surgeon, by interfering with a benign tumour with of course the best intentions, had all the same done his patient unintentional harm.

(10) *Embryonic rudiments, or Cell-rests, become active after many years and originate Cancer, so that no Germ is necessary.*—This theory is as hypothetical as the rudiments themselves. The nearest approach to such shadowy rudiments is the dermoid, which, however, consists of natural epithelial elements gone astray in development, and does not tend to become malignant.

(11) *Cancer does not appear in Epidemic or Endemic form.*—It



does not occur in epidemic form certainly, which is something to be thankful for ; but that it appears in endemic form is notorious, as evidenced by the statistics of Kalau and such significant terms as "the cancer valley."

(12) *The deaths in so-called Cancer-houses are so far apart in point of time as to have no Significance.*—This objection indicates considerable want of familiarity with the literature of the subject, and is best met by the quotation of a few instances out of the very many recorded, which to any reasonable person must be of the greatest significance.

(a) Dr. Scott (*British Medical Journal*, vol. i., 1894, p. 1,302), relates that J. K., aged 50, died of cancer of the liver ; J. L., aged 54, succeeded him, and died two years after from cancer of the bladder ; A. L., aged 60, was then appointed, and died in eighteen months of cancer of the stomach. These three men all inhabited the same room in turn, and slept in the same bed, which was a walled-in one. They were all strong and well when they came to live in this room. They were not related and they had no history of heredity.

(b) Dr. Collins supplies Mr. Nash, of Bedford, with the following case : S. S., aged 64, died in May, 1897. Her brother, E. S., aged 81, died in October, 1899, and his wife in July, 1898. The three died in the same house of cancer of the stomach, within three and a half years.

(c) Mr. S. Phillips quotes the following case : Mrs. S., aged 68, died in November, 1897, in house 78 B., from cancer of the stomach. Her daughter, Mrs. S., aged 44, died from cancer of the uterus in March, 1898, and the husband of the latter was operated on for epithelioma of the lip in the same year. These three persons were all healthy when they went to live in this house.

(13) *Experimental Inoculation in lower Animals has given negative results.*—So it has in many cases, but this objection, preferred in the face of the many successful experiments vouched for by reliable men, does not prove that inoculation cannot be successful. All that it can prove is that in these cases the successful method was not employed.

In order to be successful in experiment one should imitate as closely as possible what occurs in the cases of cancer which we meet with.

(a) Since cancer is pre-eminently a human disease the best subject for experiment would naturally be man himself. Such experiments could be made by enthusiastic self-provers, or on voluntary subjects, or on condemned criminals. Precedent for this latter method is found in the reign of George I., in 1722, when six condemned criminals were permitted to be inoculated with the virus of small-pox by the Government of that time; and lately a criminal in the Sandwich Islands was inoculated with leprosy tissue in several parts of his body, as described by Arning. Failing man himself the animals should be as anthro-poid as possible, and therefore the highest apes would be the most suitable.

(b) I consider that it is a *sine qua non* for success that a condition precedent shall exist; for this can be traced in every case of cancer if it is carefully sought for. It seems to me to be hopeless to expect successful results, for example, from feeding perfectly healthy animals upon cancerous tumours, for the intact mucous membrane of the alimentary tract is probably invulnerable. If, however, the mucous membrane of the stomach and intestines is irritated or injured, by giving at the same time spicules of bone, small pins or tacks, or fragments of glass, the soil would be prepared, and inoculation rendered possible.

Again, the tongue might be suitably prepared by breaking a tooth or two, here and there, so as to irritate and abrade it, and then the cancerous material might be rubbed in from time to time.

Suitable and sufficiently long-continued irritation should also be employed before attempted inoculation of other sites, such as the vulva, vagina, os uteri, anus, &c.

(c) I think the most suitable material for inoculation would be got from an actively enlarging metastatic tumour or lymphatic gland, since here we might expect to find the germ in its greatest activity, and free from other germs and the effete products of the original growth.

(d) The inoculation should be immediate, and while the material is still warm, from the subject supplying the cancerous material to the animal to be experimented on.

(e) The tissues chosen for experiment should be derived

from the epiblast and hypoblast, since cancer prefers epithelial surfaces.

Senn, of Chicago, who is an opponent of the infection hypothesis, had the pulp of a cancerous gland inserted into the subcutaneous and muscular tissue of his forearm, and, when no positive result occurred, emphatically asserted the non-infectivity of cancer. Here, however, the cancerous material was grafted upon mesoblastic tissue, which may be considered unsuitable soil, and there was no proper condition precedent inaugurated, nor can one negative experiment be considered conclusive. Messrs. Ballance and Shattock implanted grafts of tumours in the healthy tissues of lower animals in a similar way, with a like unsuccessful result, and probably for the same reason.

(f) Cancer is rare in the young, and therefore one can hardly expect, reasonably, to meet with success in inoculating young animals. The animals chosen should be in the latter third of their lives, *i.e.*, of such an age as would correspond to the favourite age of incidence of cancer in man.

(g) Animals should not be killed for at least six months after experiment on internal parts, such as the stomach and intestines, or when intravenous injections have been made. The more superficial parts, such as the tongue, anus, vulva, &c., would be easily under observation at all times.

(h) I do not think that experimentation with the blood or its serum, or the lymph, taken from the vicinity of cancerous tumours, or the blood from the general circulation of persons showing well marked cachexia, has been exhaustively tried.

Such are a few ideas which seem to me worthy of consideration in farther experimentation, for that cancer is transmissible to the lower animals seems proved by the simple fact that it does occur in domesticated animals, for example, the dog.

Budd has reported the instance of a pet dog which contracted cancer of the tongue after licking the cancerous lip of its master.

In the *British Medical Journal* for January 31 last, there is a leaderette treating of the views of Professor Lubarsch of Posen, who opposes the infection theory on the following grounds:—

(a) No analogy from studies of diseases of plants and animals has up to the present been brought to the support of the theory.

b) The results of statistical, epidemiological, experimental,



and clinical researches, have not furnished arguments on the side of the theory.

(c) It has not been shown that any organ is capable of producing cancerous or any other autonomous new growth.

With regard to the first two of these objections Professor Lubarsch simply denies what has already been asserted and even shown to be true by many observers of equal standing with himself.

His third objection is not only no objection at all, but is actually, on the contrary, a powerful argument in favour of the external origin of cancer. It is tantamount to stating that auto-genesis of cancer by the organism is impossible, and this is what I have consistently maintained throughout.

It is utterly unreasonable to expect any intelligent person to believe that the cells of any given part of the body which have hitherto behaved in a normal and law-abiding manner for, say, half a century, should, without rhyme or reason, suddenly break out into a state of wild anarchy, and running amok in the body, should create disaster wherever they go, which eventually ends in the destruction of the organism.

It is imperative that there must be an external stimulus which starts these cells on their wild and malignant career, and it is only reasonable to assume that that stimulus, coming from without, is an infective particle of some kind charged with its characteristic malign influence.

The ingenuity of the opponents of the infection hypothesis will no doubt suggest many more objections, but such as I have quoted are sufficient to indicate their methods.

I now offer you on the other side, the views of two men whose opinion is deserving of your respectful consideration.

Bland Sutton says: "There are many facts which indicate that cancer is induced by micro-parasites, for those glands which are direct communications with the air or intestinal gases are most prone to become cancerous, *e.g.*, the mamma, rectum, and stomach, whereas cancer of the thyroid and prostate is unusual. The great frequency of cancer in the cervical endometrium, in comparison with its infrequency in the corporeal endometrium



and its extreme rarity in the mucons membrane of the Fallopian tubes, are significant facts in relation to invasion by micro-parasites."

He says also in reference to the condition precedent: "It is a significant fact that cancer is more prone to arise in glandular organs which have been injured, or are the seat of chronic disease, than in those that are healthy. This is borne out especially in the case of cancer arising in the neck of the uterus, for this disease is almost exclusively confined to women who have been pregnant, and in the thyroid gland, for cancer of this gland is much more frequent in countries where goitre is endemic."

C. A. Ballance, after detailing certain unsuccessful experiments in inoculation of lower animals made by himself in conjunction with Mr. Shattock, says: "The theoretical considerations in favour of the micro-parasitic nature of cancer, in my judgment, remains as cogent as ever. The parasitic doctrine recommends itself as bringing the essential pathology of malignant growths into natural relation with other diseases, the parasitic pathology of which admits of scientific proof. The natural history of cancer, its auto-inoculability, and the facts relating to its distribution, all point in the same direction; and, notwithstanding the fact that no positive demonstration of the living nature of the virus is yet forthcoming, I cannot doubt that such a demonstration will eventually be achieved, and I venture to submit that no other hypothesis hitherto advanced is capable of giving an adequate explanation of the pathological phenomena of this disease."

For my own part I am satisfied that the exogenesis of cancer is clinically and logically proved, and that the discovery of a causal micro-organism, fulfilling the law of Koch, is only a matter of time. As logical proof I beg to submit these two syllogisms: (*a*) All diseases infectious to the individual are infectious to others. Cancer is infectious to the individual, therefore cancer is infectious to others. (*b*) All diseases infectious to the individual have an external origin. Cancer is infectious to the individual, therefore cancer has an external origin.

In my address I have stated my reasons for considering the infective agent to be a microphyte rather than a microzoön, and also for believing that such microphyte belongs to a certain class.

The great and desirable end to be achieved now, is the acceptance of the fact that cancer is, in truth, an infectious disease, so that prophylaxis at least may be carried out. The first and most important step to take is the adoption of compulsory notification of all cases of malignant disease, and their subsequent thorough investigation. This latter can be undertaken by the medical practitioner, while it may be safely left to the experimental pathologist to capture the elusive contagium vivum.